

REMARKS

In the Office Action, the Examiner rejected claims 1-3, 5, 6, 8 and 17-21 pursuant to 35 U.S.C. § 102(b) as being anticipated by Bradley et al. Claims 1-6, 8-10 and 17-22 were rejected pursuant to 35 U.S.C. § 102(b) as being anticipated by Napolitano et al. (U.S. 2003/0018253). Claims 7 and 23 were objected to as allowable if amended into independent form. Applicants respectfully request reconsideration of the rejections of claims 1-6, 8-10 and 17-22, including independent claims 1 and 17.

Independent claim 1 recites transmitting three waveforms from three elements in a transmit event, applying relative focusing delays or phase shifts to the waveforms for transmission, and applying additional delays or phase shifts between the waveforms so that each of the waveforms has a different amount of delay or phase shift in addition to the focusing delays or phase shifts.

Bradley et al. do not disclose these limitations. A delay memory 32 and counter 36 are used to apply focusing delays (Col. 5, lines 40-55). The Examiner cites to Col. 7, lines 16-34 for the additional delays or phase shifts. However, the discussion is for focusing delays. The enhancement of harmonic imaging is provided by the shape of the waveform or predistortion while the focusing defines the location of the region of interest (Col. 7, lines 29-35). The transmit waveform may be divided into fundamental and harmonic components (Figs. 3; and Col. 8, lines 19-26). The harmonic component has an opposite phase of sources of distortion, not relative to other waveforms (see Col. 9, lines 13-37). The distortion is determined for each channel (Col. 12, lines 16-27), but has the same or similar zero crossings as the corresponding fundamental component (Col. 14, lines 8-19). For waveform-to-waveform relative delay in the same transmit event, the delays are for focusing (Col. 14, lines 36-38 and Col. 15, lines 4-8). Bradley et al. distort the waveforms to account for second harmonic effects, but only apply the delays or phase shifts between waveforms for focusing. Bradley et al. do not apply additional delays or phase shifts between the transmitted waveforms such that three or more waveforms in a transmit event have different amounts of delay or phase shift in addition to focusing delays or phase shifts.

Dependent claims 2, 3, 5, 6 and 8 depend from claim 1, so are allowable for the same reasons. Further limitations patentably distinguish from Bradley et al. Claim 8 recites four differently delayed or phase shifted waveforms. Bradley does not disclose four such waveforms. The M-1 delay lines are used for focusing delays.

Napolitano et al. alternate one or more parameters, such as phase, as a function of scan line or beam (abstract, and paragraphs 46 and 58). To transmit a single beam, a set of signals for individual transducers are generated (paragraph 38). For different beams, different transmit events are performed (paragraph 39). For alternating phase, the phase for different beams and associated events is varied (paragraphs 39, 43 and 53). For a given transmit event, Napolitano et al. apply focusing delays with or without a common phase adjustment to vary the phase of the corresponding beam. Napolitano et al. do not apply additional delays or phase shifts between waveforms of a transmit event. Napolitano et al. vary beam-by-beam, not waveform-by-waveform making a beam.

Dependent claims 2-6, 8-10 depend from claim 1, so are allowable for the same reasons. Further limitations patentably distinguish from Napolitano et al. Claim 2 recites additional and focusing delays, but Napolitano et al. apply focusing delays and not additional delays. Claim 6 recites repeating the different additional delay pattern across the array. Napolitano et al. repeat for beams not across an array.

Claim 17 recites applying focusing delays or phase shifts to waveforms transmitted from elements in a transmit event and applying additional delays or phase shifts and a sign change between waveforms.

Bradley et al, as discussed above, do not apply additional delay or phase shift, so do not disclose claim 17. Bradley et al. use focusing delays or phase shifts without additional phase shifts or delays between waveforms.

Also as discussed above, Napolitano et al. vary phase between beams, not between waveforms of a transmit event. Napolitano et al. do not disclose applying additional delays or phase shifts between waveforms of a transmit event.


Dependent claims 18-22 depend from claim 17, so are allowable for the same reasons. Further limitations patentably distinguish from Bradley et al. and Napolitano et al., such as limitations discussed above for similar dependent claims. Claim 22 recites inverting a waveform and then applying relative delay of about $\frac{1}{2}$ a period. Bradley et al. and Napolitano et al. do not disclose these limitations.

CONCLUSION:

Applicants respectfully submit that all of the pending claims are in condition for allowance and seeks early allowance thereof. If for any reason, the Examiner is unable to allow the application but believes that an interview would be helpful to resolve any issues, he is respectfully requested to call the undersigned at (650) 943-7554 or Craig Summerfield at (312) 321-4726.

PLEASE MAIL CORRESPONDENCE TO: Respectfully submitted,

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